

cells become absorbed. In *C. glauca* and *Rumphiana* tracheides are formed, analogous to the elaters of the Hepaticæ; their function is uncertain. The megaspores, or embryo-sacs, of which there are usually from sixteen to twenty, lengthen in the direction of the chalaza, some of them sometimes penetrating and forming "tails" between the elements of the fibrovascular bundle of the funicle. The sister-cells of the embryo-sacs, instead of being absorbed at an early period, as in other Angiosperms, disappear only much later. The megaspores which develop fully divide at the end into two or three cells, which are in most cases naked, and result from the division of a single cell. In the great majority of cases only a single megaspore in each nucellus has these terminal or sexual cells furnished with cell-walls; this is the future embryo-sac. The oosphere is always formed from the sexual cell which has the thickest wall. No antipodals are formed.

Only a single ovule is ever fertilized, and the pollen-grain which fecundates it advances towards the embryo-sac in a way entirely different from anything that occurs in other Phanerogams. The pollen-tube does not enter the ovarian cavity; it descends the stylary cylinder, crosses the bridge and the tissue which unites the ovule with the wall of the ovary, and arrives at the fibrovascular bundle which leads to the chalaza, where it produces two short branches, then traverses the chalaza, and enters the ovule by means of the "tail" of a sterile megaspore, and continues its course towards the embryo-sac. Towards the middle of the nucellus it contracts, tapers off, and ruptures, the terminal fecundating portion becoming separated from the rest of the pollen-tube. This portion, which has a thickened wall, and contains distinct protoplasm, never enters the micropyle or the embryo-sac, but becomes firmly attached to the wall of the latter, at a spot variable in position, but always at some distance from the sexual apparatus. Dr. Treub has not, at present, been able to detect in this portion a definite nucleus, or to follow the actual process of fecundation. During the development of the embryo-sac, numerous endosperm-nuclei are formed, and subsequently the embryo makes its appearance. The mode of development of the embryo does not differ from that which occurs in other Dicotyledons.

The peculiar processes which accompany the act of fecundation, and the presence of a large number of megaspores, each containing a sexual apparatus, induce Dr. Treub to regard the Casuarinaceæ as a distinct group of Angiosperms, of equal rank with the Monocotyledones and Dicotyledones together, and he proposes the following primary classification of Phanerogams:—

- I. GYMnosPERMS.
- II. ANGiosPERMS.
 - A. CHALAZOGAMS (Casuarinaceæ).
 - B. POROGAMS.
 - 1. *Monocoty'edones*.
 - 2. *Dicotyledones*.

The Chalazogams are not intermediate between Gymnosperms and Angiosperms, but occupy an isolated and inferior position among the latter, somewhat analogous to that of *Lycopodium* among Vascular Cryptogams. The paper is illustrated by 21 fine plates. A. W. B.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—*Endowment of Original Research*.—The following notice has been received by the Vice-Chancellor:—A gentleman has established a Scholarship of £100, tenable for one year, for the encouragement of original research. The Scholar will be selected by a Committee composed of Dr. George Thin, Surgeon-General Cornish, and Prof. A. Winter-Blyth. The conditions of the Scholarship are, that the research be on a subject requiring for its elucidation both chemical and bacteriological methods, and the subject will be selected by the Committee of Selection. With the concurrence of the Scholar, the work is to be done in the laboratories of the College of State Medicine, 101 Great Russell Street, W.C., and the Scholar will have to devote his whole time to the work. Application to be made to Surgeon-General Cornish, on or before April 18, 1892.

In a Convocation held on April 5, it was decreed (the Council of the Royal Geographical Society having offered a further sum of £150 a year, to be met by an equal sum from the University, for the payment of a Reader in Geography

during the next five years) that the offer be accepted, and that the thanks of the University should be conveyed to the Council of the Royal Geographical Society for their liberal offer.

The programme of the fifth summer meeting of University Extension and other students, to be held in Oxford in July and August 1892, has been issued, and in its general character resembles that of last year. The inaugural lecture will be delivered by Mr. John Addington Symonds (if his health permits) on Friday, July 29, at 8.30 p.m. The meeting will, as in former years, be divided into two parts, viz. from July 29 to August 9, and from August 10 to August 26. In Natural Science the following arrangements have been made:—

In Chemistry: a course of eighteen days' practical instruction in the University laboratory, limited to 100 students, conducted by Messrs. J. E. Marsh and A. D. Hall of Balliol College.

In Geology: a special course of fourteen days' practical instruction, with field work provided, if at least 40 students offer themselves.

In Botany: in addition to lectures on primroses and their relations, it is proposed to arrange, for a class of not less than 40 students, a three weeks' course of practical instruction.

In Biology: to the same minimum number of students is offered a special course of lectures and demonstrations in the physiological laboratory, to form an introduction to the study of life, and especially of nervous organisms.

Courses of lectures and instruction on Astronomy, Mechanics, Sound, Light and Heat, Electricity, Physiography, and Hygiene can be arranged.

It is also announced that there will be no summer meeting in 1893, as during August in that year the Examination Schools will be in the hands of workpeople.

ST. ANDREWS.—*Summer Session*.—A course of lectures in zoology and botany, qualifying for graduation, will commence on May 2, the former by Prof. Prince, the latter by Mr. Robertson, the University Lecturer on Botany. These are open to students of either sex.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 31.—"Aberration Problems: a Discussion concerning the Connection between Ether and Matter, and the Motion of the Ether near the Earth." By Oliver Lodge, F.R.S., Professor of Physics, University College, Liverpool.

The paper begins by recognizing the distinction between ether in free space and ether as modified by transparent matter, and points out that the modified ether, or at least the modification, necessarily travels with the matter. The well-known hypothesis of Fresnel is discussed and re-stated in modern form.

Of its two parts, one has been verified by the experiment of Fizeau, the other has not yet been verified. Its two parts are, (1) that inside transparent matter the velocity of light is affected by the motion of that matter, and (2) that immediately outside moving matter there is no such effect. The author proceeds to examine into the truth of this second part, (1) by discussing what is already known, (2) by fresh experiment.

The phenomena resulting from motion are four, viz.:—

(1) Changes in direction, observed by telescope and called aberration.

(2) Change in frequency, observed by spectroscope and called Doppler effect.

(3) Change in time of journey, observed by lag of phase or shift of interference bands.

(4) Change in intensity, observed by energy received by thermopile.

After a discussion of the effects of motion in general, which differ according as projectiles or waves are contemplated, the case of a fixed source in a moving medium is considered; then of a moving source in a fixed medium; then the case of medium alone moving past source and receiver; and, finally, of the receiver only moving.

It is found that the medium alone moving causes no change in direction, no change in frequency, no detectable lag of phase, and probably no change of intensity; and hence arises the difficulty of ascertaining whether the general body of the ether is moving relatively to the earth or not.

A clear distinction has to be drawn, however, between the effect of general motion of the medium as a whole, and motion

of parts of the medium, as when dense matter is artificially moved. The latter kind of motion may produce many effects which the former cannot.

A summary of this part of the discussion is as follows:—

Source alone moving produces a real and apparent change of colour; a real but not apparent error in direction; no lag of phase, except that appropriate to altered wave-length; a change of intensity corresponding to different wave-lengths.

Medium alone moving, or source and receiver moving together, gives no change of colour; no change of direction; a real lag of phase, but undetectable without control over the medium; a change of intensity corresponding to different distances but compensated by change of radiating power.

Receiver alone moving gives an apparent change of colour; an apparent change of direction; no change of phase, except that appropriate to extra virtual speed of light; change of intensity corresponding to different virtual velocity of light.

The probable absence of a first order effect of any kind, due to ethereal drift or relative motion between earth and ether, makes it necessary to attend to second order effects.

The principle of least time is applied, after the manner of Lorentz, to define a ray rigorously, and to display the effect of existence or non-existence of a velocity potential. Fresnel's law is seen to be equivalent to extending the velocity potential throughout all transparent matter.

It is shown that a ray traversing space or transparent substances will retain its shape, whatever the motion of the medium, so long as that motion is irrotational, and that in that case the apparent direction of objects depends simply on motion of observer; but, on the other hand, that if the earth drags with it some of the ether in its neighbourhood, stellar rays will be curved, and astronomical aberration will be a function of latitude and time of day.

The experiment of Boscovich, Airy, and Hoek, as to the effect of filling a telescope-tube with water, does not discriminate between these theories. For if the ether is entirely non-viscous and has a velocity potential, stellar rays continue straight, in spite of change of medium (or at oblique incidence are refracted in the simple manner), and there will be no fresh effect due to change of medium; while, if, on the contrary, the ether is all carried along near the earth, then it is stationary in a telescope tube, whether that be filled with water or air, and likewise no effect is to be expected. In the case of a viscous ether, all the difficulty of aberration must be attacked in the upper layers above the earth; all the bending is over by the time the surface is reached. It is difficult to see how an ethereal drift will not tend to cause an aberration in the wrong direction.

Of the experiments hitherto made by Arago, Babinet, Maxwell, Mascart, Hoek, and perhaps others, though all necessary to be tried, not one really discriminates between the rival hypotheses. All are consistent either with absolute quiescence of ether near moving bodies, or with relative quiescence near the earth's surface. They may be said, perhaps, to be inconsistent with any intermediate position.

Two others, however, do appear to discriminate, viz. an old and difficult polarization experiment of Fizeau (*Ann. de Chim. et de Phys.*, 1859), which has not been repeated since, and the recent famous experiment of Michelson (*Phil. Mag.*, 1887) with rays made to interfere after traversing and retraversing paths at right angles.

The conclusions deducible from these two experiments are antagonistic. Fizeau's appears to uphold absolute rest of ether; Michelson's upholds relative rest, i.e. drag by the earth.

The author now attempts a direct experiment as to the effect of moving matter on the velocity of light in its neighbourhood; assuming that a positive or negative result with regard to the effect of motion on the velocity of light will be accepted as equivalent to a positive or negative result with respect to the motion of the ether.

He gives a detailed account of the experiment, the result of which is to show that such a mass as a pair of circular saws clamped together does not whirl the ether between the plates to any appreciable amount, not so much, for instance, as a 1/500th part of their speed. He concludes, therefore, that the ether is not appreciably viscous. But, nevertheless, it may perhaps be argued that enormous masses may act upon it gravitationally, straining it so as perhaps to produce the same sort of effect as if they dragged it with them. He proposes to try the effect of a larger mass. Also to see if, when subject to a strong magnetic field, ether can be dragged by matter.

The aberrational effect of slabs of moving transparent matter is considered, also the effect of a differently refractive medium.

Motion of medium, though incompetent to produce any aberrational or Doppler effect, is shown to be able to slightly modify them if otherwise produced.

The Doppler effect is then entered into. The question is discussed as to what the deviation produced by a prism or a grating really depends on: whether on frequency or wave-length. It is shown that whereas the effect of a grating must be independent of its motion and depend on wave-length alone, yet that the effect observed with a moving grating by a moving observer depends on frequency, because the motion of the observer superposes an aberrational effect on the true effect of the grating. This suggests a means of discriminating motion of source from motion of observer; in other words, of detecting absolute motion through ether; but the smallness of the difference is not hopeful.

Michelson's experiment is then discussed in detail, as a case of normal reflection from a moving mirror or from a mirror in a drifting medium. No error in its theory is discovered.

The subjects of change of phase, of energy, of reflection in a moving medium, work done on a moving mirror, and the laws of reflection and refraction as modified by motion, are considered.

It is found that the law of reflection is not really obeyed in a relatively moving medium, though to an observer stationary with respect to the mirror it appears to be obeyed, so far as the first order of aberration magnitude is concerned; but that there is a residual discrepancy involving even powers of aberration magnitude, of an amount possibly capable of being detected by very delicate observation.

The following statements are made and justified:—

(1) The planes of incidence and reflection are always the same.

(2) The angles of incidence and reflection, measured between ray and normal to surface, usually differ.

(3) If the mirror is stationary and medium moving, they differ by a quantity depending on the square of aberration magnitude, i.e. by 1 part in 100,000,000; and a stationary telescope, if delicate enough, might show the effect.

(4) If the medium is moving and mirror stationary, the angles differ by a quantity depending on the first power of aberration magnitude (1 part in 10,000), but a telescope moving with the mirror will not be able to observe it; for the commonplace aberration caused by motion of receiver will obliterate the odd powers and leave only the even ones; the same as in case (3).

(5) As regards the angles which the incident and reflected waves make with the surface, they differ in case (3) by a first order magnitude, in case (4) by a second order magnitude.

(6) At grazing incidence the ordinary laws are accurately obeyed. At normal incidence the error is a maximum.

(7) The ordinary laws are obeyed when the direction of drift is either tangential or normal to the mirror, and is disobeyed most when the drift is at 45°.

(8) In general, the shape of the incident wave is not precisely preserved after reflection in a moving medium. To a parallel beam the mirror acts as if slightly tilted; to a conical beam as if slightly curved. But either effect, as observable in the result, is almost hopelessly small.

(9) Similar statements are true for refraction, assuming Fresnel's law.

The possibility of obtaining first order effects from general ethereal motion by means of electrical observations is considered.

Chemical Society, March 17.—Dr. W. J. Russell, F.R.S. Vice-President, in the chair.—The following papers were read:—A study of the conditions which determine combination between the cyanides of zinc and mercury, and of the composition and properties of the resulting double salt, by W. R. Dunstan. When a solution of zinc sulphate is added to one of mercuric potassium cyanide, $\text{HgK}_2(\text{CN})_4$, or when mercuric chloride is added to a solution of zinc potassium cyanide, $\text{ZnK}_2(\text{CN})_4$, a white precipitate is formed, which has been stated, on the authority of Gmelin, to consist of a double cyanide of zinc and mercury of the formula $\text{ZnHg}(\text{CN})_4$. This, however, is not the case. The maximum amount of mercuric cyanide that can be retained by the precipitate is only 38.5 per cent., and is dependent on the amount of water present during precipitation as well as on the proportions in which the salts interact. When

washed with cold water the precipitate loses a large proportion, though not all, of the mercuric cyanide contained in it. Boiling water and cold potassium iodide solution extract the mercuric cyanide more readily. Experiments have been made in which the relative masses of the interacting substances were varied, these experiments prove that a true compound of the two cyanides is formed, and suffers decomposition to a greater or less extent, depending on the amount of water present. An examination of the curves plotted from these results leads to the inference that the double salt is a tetrazincic monomercuridecyanide, $\text{Zn}_4\text{Hg}(\text{CN})_{10}$.—A lecture experiment to illustrate the phenomena of coal-dust explosions, by T. E. Thorpe. The author describes an apparatus by means of which the phenomena of a coal-dust explosion, resulting either from a local explosion of fire-damp or by the direct action of a blown-out shot, may be illustrated. The apparatus consists of a long narrow wooden box having an explosion chamber at one end; a thin layer of fine coal-dust or lycopodium powder is spread along the bottom of the box. On firing a mixture of coal-gas and air in the explosion chamber, the explosive wave sweeps along the box with increasing strength until it shoots out at the open end of the apparatus. By observations made with this apparatus the author finds that there is no evidence of a diminution of pressure along the sides of the space through which the flame rushes, and he is of opinion that there is no experimental proof of the validity of the "suction theory," which assumes that in consequence of this alleged diminution of pressure, occluded fire-damp is drawn out from the coal, and contributes to the violence of the explosion.—The production of the ketone, 1:2:4 acetylorthoxylene from camphor by the action of sulphuric acid and zinc chloride, by H. E. Armstrong and F. S. Kipping. The authors have previously stated that they have separated a ketone of the composition $\text{C}_9\text{H}_{12}\text{O}$ from the crude product of the action of sulphuric acid on camphor. On treatment with bromine the ketone yields a compound which readily decomposes, giving a monobromo-derivative, $\text{C}_9\text{H}_{11}\text{BrO}$, melting at $63^\circ\text{--}64^\circ$. When oxidized with dilute nitric acid, the ketone yields two acids, separable by means of chloroform. One of these proves to be paraxylic acid, viz. 1:2:4 dimethylbenzoic acid, whilst the other is xylinic or 1:2:4 methylisophthalic acid. The ketone is therefore 1:2:4 acetylorthoxylene, a compound which Claus has synthesized from acetic chloride and orthoxylene in presence of aluminium chloride.—Platinum tetrachloride, by W. Pullinger. The author has obtained platinum tetrachloride by heating hydrated hydrogen platinum chloride in a current of dry hydrogen chloride at 163° for fifteen hours. When thus prepared, it is a very soluble, but not deliquescent, substance.—Note on a new acid from camphoric acid, by W. H. Perkin, Jun. When warmed with sulphuric acid, camphoric acid is converted into sulphocamphoric acid, with loss of water and carbon monoxide, $\text{C}_9\text{H}_{16}\text{O}_4 + \text{H}_2\text{SO}_4 = \text{C}_9\text{H}_{16}\text{SO}_6 + \text{CO} + \text{H}_2\text{O}$. Kachler found that, when fused with potash, sulphocamphoric acid yields a crystalline substance, $\text{C}_9\text{H}_{12}\text{O}_2$, melting at 148° , which is apparently not an acid. The author in repeating Kachler's experiments, but sulphoning at 100° instead of at 65° , obtained a well-characterized monobasic acid, $\text{C}_9\text{H}_{12}\text{O}_2$, isomeric with this substance and melting at 108° . It would appear from these results that the acid obtained by sulphoning camphoric acid at 100° is isomeric with ordinary sulphocamphoric acid.—The specific rotatory and cupric reducing power of invert sugar and of dextrose obtained from cane sugar by means of invertase, by J. O'Sullivan. The author describes experiments in which the hydrolysis of cane sugar was effected by means of invertase instead of by means of acid. The specific rotatory power of invert sugar obtained by means of invertase, which has no action on laevulose, is $[\alpha]_D = -24^\circ 5'$, and that of the dextrose prepared from such invert sugar is $[\alpha]_D = 57^\circ$. The apparent specific rotatory power of laevulose calculated from these numbers is $[\alpha]_D = -106^\circ$, or $[\alpha]_D = -93^\circ 8'$, a value agreeing with that generally accepted.—Ethylidimethylamidobenzene, by W. R. Hodgkinson and L. Limpach. This amine is prepared by heating paraxylidine hydrochloride with ethyl alcohol at $250^\circ\text{--}300^\circ$. It is purified from diethyldimethylamidobenzene by crystallization of the sulphates. The sulphate of the latter substance is the more soluble. The formyl and acetyl derivatives of the amine are described.—Action of nitric acid on oxanilide and its analogues, by A. G. Perkin. The author finds that oxanilide and its analogues are readily converted by nitration into the higher nitro-derivatives, thus differing from acetanilide and similar compounds, which yield dinitro-derivatives only with great difficulty.

Royal Meteorological Society, March 16.—Dr. C. Theodore Williams, the President, delivered an address on the value of meteorological instruments in the selection of health resorts. He drew attention to thermometers, maximum and minimum, as the foundation-stone on which medical climatology rests, and instanced effects of extreme cold or of heat on the human organism. The direct rays of the sun are of the greatest importance, and in health resorts should be utilized to the full—in fact, only climates where during the winter months even a delicate person can lie or sit for several hours a day basking in the sunshine are to be recommended for most complaints, and the various forms of sunshine-recorders are used to aid the medical adviser in the choice of such health stations. After referring to the value of rain-gauges, hygrometers, and barometers, Dr. Williams stated that many health resorts owe their reputation almost solely to their shelter from cold winds; for instance, the advantage in climate which Hyères and Mentone enjoy over Marseilles is chiefly due to their being more sheltered from the Mistral, or north-west wind, the scourge of the lower valley of the Rhone from Valence to Avignon. He went on to describe the climate of the Riviera, illustrating it by lantern slides from recent photographs, including views of Hyères, Costabelle, Cannes, Nice, Mentone, San Remo, &c., and he showed the three principal causes of the warm winter of this region to be (1) the southern latitude, (2) the protection from cold winds by mountain ranges, and (3) the equalizing and warming influence of the Mediterranean Sea, which, being practically tideless, is always equally potent, not varying with hour and season. Dr. Williams mentioned the weak points of the south of France climate, with its blustering Mistral, its occasional cold Bise, its moist Scirocco wind; but summed up the Riviera winter climate as being, as a whole, clear, bright, and dry, with fog and mist practically unknown, with a winter temperature from 8° to 10° higher than England though subject to considerable nocturnal radiation, with about half the number of rainy days, and four or five times the number of bright ones, which we can boast of, with cold winds and cold weather, without which it would lose its health-giving effect.—After the delivery of this address the meeting was adjourned in order to allow the Fellows and their friends an opportunity to inspect the Exhibition of Instruments relating to climatology, which had been arranged in the rooms of the Institution of Civil Engineers, 25 Great George Street. The Meteorological Office showed a set of instruments necessary for the equipment of a climatological station, viz. Stevenson thermometer screen, fitted with dry bulb, wet bulb, maximum and minimum thermometers, and also a rain gauge. Thermometers were also shown for ascertaining the temperature on the ground, under the ground, and at a distance, as well as for recording temperature continuously. Various forms of sunshine-recorders were exhibited, as well as a number of actinometers and solar radiation instruments for ascertaining the heating effect of the solar rays. The Exhibition included a large and interesting collection of hygrometers, also several rain-gauges and other instruments. Among the curiosities was a piece of plate glass, which was "starred" during a thunderstorm on August 21, 1879; this was not broken, but it has a number of wavy hair-like lines. The Exhibition contained a large number of beautiful photographs of clouds, lightning, and snow scenes, as well as of the damage done by the destructive tornado at Lawrence, Mass., U.S.A. The Exhibition remained open until Tuesday, the 22nd ult.

Anthropological Institute, March 22.—Francis Galton, F.R.S., Vice-President, in the chair.—Mr. Theodore Bent read a paper on the finds at the Great Zimbabwe ruins. The outer wall of the semicircular temple on the hill is decorated by a number of birds perched on long soapstone pedestals, all of which appear to be intended to represent the same bird, probably a vulture. Two of the birds, similar in character and slightly varying from the others, are represented as perched on zones or cesti, and there seems to be a similar class of symbolism connecting them all. Mr. Bent is of opinion that these birds represent the Assyrian Astarte or Venus—the female element in creation. In the centre of the temple stood an altar, into the stones of which were inserted a large number of soapstone objects, which afforded ample evidence of the existence of phallic worship in this place. Within the sacred enclosure are two solid round towers, the largest of which is 34 feet in height and has a girth of 53 feet. Before them is a raised platform, presumably for sacrifice, and the wall behind them is decorated

with large standing monoliths. Some of the fragments of pottery found are very good, and give evidence of a highly developed artistic skill. Close underneath the temple stood a gold-smelting furnace, made of very hard cement of powdered granite, with a chimney of the same material, and the quantity of rejected quartz found hard by proved that these ruins had formed the fortress for the protection of a gold-producing people. The ruins and the things in them are not in any way connected with any known African race; the objects of art and of special cult are foreign altogether to the country, and neither the date of construction nor the race of the builders can now be determined with accuracy; but the evidence in favour of this race being one of the many tribes of Arabia is very strong, and all the facts point to a remote antiquity.

PARIS.

Academy of Sciences, March 28.—M. d'Abbadie in the chair.—Note on a theorem on the calculation of probabilities, by M. J. Bertrand.—On the periodic variations of latitude, according to a letter from M. Helmet to the members of the Permanent Commission of the International Geodetic Association, by M. Faye. (See Our Astronomical Column.)—On the approximate theoretical calculation of the delivery from an orifice in a thin wall, by M. J. Boussinesq.—On the population of the five continents of the earth, by M. Émile Levasseur. A comparison of M. Levasseur's estimations with those given by others shows that the differences are greater for Africa, Asia, Oceania, and America, than for Europe. This is what would be expected. M. Levasseur's numbers are as follows:—

	Area, in millions of square kilometres.	Population, in millions.
Europe	10'0	360
Africa	30'5	153
Asia	42'2	824
Oceania	11'1	38
North America	23'7	88
South America	18'7	34
Total	136'2	1497

—Note on a theory on the production of various vegetable galls, by M. A. Laboulbène.—Mechanical laws of atmospheric circulation; surfaces of equal density; squalls; secondary and general circulations, by M. Le Goarant de Tromelin.—Observations of Swift's comet (Rochester, March 6, 1892) and of the minor planet discovered by Wolf on March 18, made with the East Tower equatorial of Paris Observatory, by Mdlle. D. Klumpke. Observations for position were made on March 17, 21, 23, and 24.—Observations of Swift's comet made at Toulouse Observatory, by M. B. Baillaud. Observations for position were made on March 16, 18, 19, 21, and 25.—Observations of Wolf's periodic comet made with the great telescope of Toulouse Observatory, by MM. E. Cosserat and F. Rossard. Dates of observations for position: November 28, December 1, 4, 21, 22, 26, and 31.—On plane *réseaux* having equal invariants, by M. G. Koenigs.—On congruences of which the mean surface is a plane, by M. C. Guichard.—On the existence of integrals in differential systems, by M. Riquier.—An electro-ballistic chronograph, by M. W. Schmidt.—On the radiations of incandescent bodies and the optical measure of high temperatures, by M. J. Violle. By estimating the intensities of the lines at C and D in the radiations of a piece of platinum, the author has determined the temperature of the metal. His results agree very well with those obtained by M. Le Chatelier up to 1500°.—On the temperature of the sun, by M. H. Le Chatelier. (See Our Astronomical Column.)—Application of the theory of lines of force to the demonstration of an electrostatic theorem, by M. L. de la Rive.—On electro-capillary phenomena, by M. A. Berget.—On a safety-lamp for use with coal gas, by M. F. Parmentier. The author records some experiments on the action of platinum wires and crucibles in cooling flames below the temperature necessary for the combustion of the gases.—Action of potassium fluoride on anhydrous chlorides; preparation of anhydrous fluorides of nickel and potassium, and of cobalt and potassium, by M. C. Poulenc. The compounds prepared have the composition NiKF_3 and CoKF_3 . Full descriptions are given of the mode of preparation and the properties of the new substances.—On the fixation of iodine by starch, by M. G. Rouvier.—On the estimation of fluorine, by M.

Ad. Carnot.—On the aldehydes and acetone bromides which result from the action of bromine on alcohols of the fatty group, by M. A. Etard.—On propylamines and some of their derivatives, by M. F. Chancel.—On some reactions of isomeric amido-benzoic acids, by M. Oechsner de Coninck.—Study of the velocity of decomposition of diazo-compounds, by MM. J. Hausser and P. Th. Muller.—On two fluorhydrines of glycerine, by M. Maurice Meslans. (See Notes.)—On the mode of union of rings of the abdomen (zigzag articulation) of Hymenoptera, by M. G. Carlet.—On the embryonic development of the Galathea of the genus *Diptychus*, by M. E. L. Bouvier.—On the histology of the pituitary gland, by M. G. Saint-Remy.—On the blue colouring matter in the blood of Crustacea, by M. F. Heim.—On a new marine Rhizopod (*Pontomyxa flava*, g. et sp. n.), by M. E. Topsent.—The streptony nervous system of Heteropods, by M. Paul Pelseneer.—Observations on *Anthraxnose maculée*, by M. Louis Mangin.—On the artificial culture of Diatomaceæ, by M. P. Miquel.—On the crystalline rocks of Chablais, by M. Michel-Lévy.—The Saint-Béat marble, its age and stratigraphical relations, by M. Caralp.—On some minimum perceptible quantities of certain odours, by M. Jacques Passy.—Difference in the functions exercised on the bladder by the afferent nerves of the hypogastric plexus, by M. Lannegrace.—On the Martinique cyclone of August 18, 1891, by M. G. Landes.—Magnetic disturbances and seismic phenomena, by M. Émile Riviére.

BOOKS and PAMPHLETS RECEIVED.

BOOKS.—Index of Meteorological Observations in the United States (Washington).—Essex Institute Historical Collections, vol. xxvii. (Salem, Mass.)—A New Course of Experimental Chemistry: J. Castell-Evans (Munby).—Souvenir of Shakespeare's King Henry the Eighth (*Black and White*).—Deutsches Meteorologisches Jahrbuch für 1890 (Hamburg).—Island Life, 2nd edition: A. R. Wallace (Macmillan).—A Naturalist in the Transvaal: W. L. Distant (Porter).—The Clyde Sea Area: Dr. H. R. Mill (Williams and Norgate).—Live Stock: Prof. J. Wrightson (Cassell).—The Great Earthquake in Japan, 1891: J. Milne and W. K. Burton (Stanford).

PAMPHLETS.—Azimut Assoluto del Segnale Trigonometrico di Monte Vesco sull'orizzonte di Torino: F. Porro (Torino).—Ergebnisse der Meteorologischen Beobachtungen im Systeme der Deutsche Seewarte für das Lustrum 1886-90 (Hamburg).

CONTENTS.

	PAGE
Mendeléeff's Principles of Chemistry. By T. E. T.	529
The Ligation of the Great Arteries. By Dr. M. Armand Ruffer	530
Our Book Shelf:—	
Streeter: "Precious Stones and Gems: their History, Sources, and Characteristics"	531
Lewes: "Air and Water"	531
Letters to the Editor:—	
Ornithology of the Sandwich Isles.—Prof. Alfred Newton, F.R.S.; J. E. Harting	532
Poincaré's Thermodynamics.—P. G. T.	532
M. Poincaré and Maxwell.—Prof. Geo. Fras. Fitzgerald, F.R.S.	532
Prof. Burnside's Paper on the Partition of Energy, R.S.E., July 1887.—Prof. W. Burnside; S. H. Burbury, F.R.S.	533
Double Orange.—Gerald B. Francis	534
Metals at High Temperatures. (Illustrated.) By Prof. W. C. Roberts-Austen, C.B., F.R.S.	534
On Insect Colours. II. By F. H. Perry Coste	541
Examination of the Standards of Measure and Weight immured in the Houses of Parliament	543
Notes	543
Our Astronomical Column:—	
The Relative Motion of 61 Cygni	547
The Temperature of the Sun	547
Comet Swift, March 6	548
Wolf's Comet, 1891 II.	548
Periodic Perturbations of the Four Inner Planets	548
N.P.D.'s observed with Greenwich and Washington Transit Circles	54
Washington Observations, 1887	548
Fertilization of the Casuarinaceæ. By A. W. B.	548
University and Educational Intelligence	549
Societies and Academies	549
Books and Pamphlets Received	552